

# Mechanics, Installers, and Repairers

## Electrical and Electronic Equipment Mechanics, Installers, and Repairers

### Computer, Automated Teller, and Office Machine Repairers

(O\*NET 85705 and 85926)

#### Significant Points

- Job opportunities will be best for applicants with knowledge of electronics, as well as repair experience.
- Employers prefer workers who have training in electronics from associate degree programs, vocational schools, or equipment manufacturers; for computer repair jobs, certification provides applicants with a competitive advantage.
- Faster than average job growth will be driven by the increasing dependence of business and residential customers on computers and sophisticated office machines.

#### Nature of the Work

*Computer and automated teller machine repairers*, also known as data processing equipment repairers, maintain mainframe and personal computers; printers and other peripheral equipment; and automated teller machines (ATMs). Declining equipment prices and the increasing popularity of the Internet have added to the widespread use of computers. ATMs are also widespread, allowing customers to carry out bank transactions without the assistance of a teller. ATMs now provide a growing variety of other services, including stamp, phone card, and ticket sales. Computer repairers primarily provide hands-on repair service. Workers who provide technical assistance, in person or via telephone, to computer system users are known as computer support specialists. (See the statement on computer systems analysts, engineers, and scientists elsewhere in the *Handbook*.)

*Office machine repairers*, also known as office machine and cash register servicers, work on photocopiers, cash registers, mail processing equipment, fax machines, and typewriters. Newer models of office machinery increasingly include computerized components that allow them to function more effectively than earlier models.

To install large equipment, such as mainframe computers and automated teller machines, repairers connect the equipment to power sources and communication lines. These lines allow the transmission of information over computer networks. For example, when an ATM dispenses cash, it also transmits the withdrawal information to the customer's bank. Workers may also install operating software and peripheral equipment, checking that all components are configured to correctly function together. The installation of personal computers and other small office machines is less complex and may be handled by the purchaser.

When equipment breaks down, many repairers travel to customers' workplaces or other locations to make the necessary repairs. These workers, known as field technicians, often have assigned areas where they perform preventive maintenance on a regular basis. Bench technicians work in repair shops located in stores, factories, or service centers. In small companies, repairers may work in both repair shops and at customer locations.

Computer repairers usually replace defective components, instead of repairing them. Replacement is common because components are inexpensive, and businesses are reluctant to shut down their computers for time-consuming repairs. Components commonly replaced by computer repairers include video cards, which transmit signals from the computer to the monitor; hard drives, which store data; and network cards, which allow communication over the network. Defective components may be given to bench technicians, who use software programs to diagnose the problem and who may repair the components, if possible.

When ATMs malfunction, computer networks recognize the problem and alert repairers. Common problems include worn magnetic heads on card readers, preventing the equipment from recognizing customer bankcards; and "pick failures," preventing the equipment from dispensing the correct amount of cash. Field technicians travel to the locations of ATMs and usually repair equipment by replacing defective components. Components that cannot be replaced are brought to a repair shop where bench technicians perform the necessary repairs. Field technicians perform routine maintenance on a regular basis, replacing worn parts and running diagnostic tests to insure that the equipment functions properly.

Office machine repairers usually work on machinery at the customer's workplace; customers may also bring small equipment to a repair shop for maintenance. Common malfunctions include paper misfeeds, due to worn or dirty parts, and poor copy quality, due to problems with lamps, lenses, or mirrors. These malfunctions can usually be resolved by simply cleaning components. Breakdowns may also result from failure of commonly used parts. For example, heavy usage of a photocopier may wear down the printhead, which applies ink to the final copy. In such cases, the repairer usually replaces the part, instead of repairing it.

Workers use a variety of tools for diagnostic tests and repair. To diagnose malfunctions, they use multimeters to measure voltage, current, and resistance; signal generators to provide test signals; and oscilloscopes to monitor equipment signals. When diagnosing computerized equipment, repairers also use software programs. To repair or



*Computer, automated teller, and office machine repairers use specialized repair tools.*

adjust equipment, workers use hand tools, such as pliers, screwdrivers, soldering irons, and wrenches.

### Working Conditions

Repairers usually work in clean, well-lighted surroundings. Because computers and office machines are sensitive to extreme temperatures and to humidity, repair shops are usually air-conditioned and well ventilated. Field repairers must travel frequently to various locations to install, maintain, or repair customer equipment. ATM repairers may have to perform their jobs in small, confined spaces, which house the equipment.

Because computers and ATMs are critical for many organizations to function efficiently, data processing repairers often work around the clock. Their schedules may include evening, weekend, and holiday shifts; shifts may be assigned on the basis of seniority. Office machine repairers usually work regular business hours, because the equipment they repair is not as critical.

Although their job is not strenuous, repairers must lift equipment and work in a variety of postures. Repairers of computer monitors need to discharge voltage from the equipment to avoid electrocution. Workers may have to wear protective goggles.

### Employment

Computer, automated teller, and office machine repairers held about 138,000 jobs in 1998. About 3 out of 5 repaired computer and automated teller equipment, and the remainder repaired office machines. Wholesale trade establishments employed about one half of the workers in this occupation; most of these establishments were wholesalers of professional and commercial equipment. Many workers were employed in computer and data processing services, as well as radio, television, and computer stores. About 1 in 8 computer, automated teller, and office machine repairers was self-employed.

### Training, Other Qualifications, and Advancement

Knowledge of electronics is necessary for employment as a computer, automated teller, or office machine repairer. For positions repairing computers and automated teller machines, employers prefer workers who are certified as repairers or who have training in electronics from associate degree programs, vocational schools, or equipment manufacturers. Employers generally provide some training to new repairers; however, workers are expected to arrive on the job with a basic understanding of equipment repair. Employers may send experienced workers to training sessions to keep up with changes in technology and service procedures.

For positions repairing office machines, a basic understanding of electronics is important. Employers prefer applicants with training from vocational schools or equipment manufacturers or who have some work experience. Entry level employees at large companies normally receive on-the-job training lasting several months. This may include a week of classroom instruction followed by several months of hands-on training.

Field technicians work closely with customers and must have good communications skills and a neat appearance. Employers may also require that field technicians have a driver's license.

Several organizations administer certification programs for electronic or computer equipment repairers. A+ Certification is available through the Computing Technology Industry Association (CompTIA). Candidates must pass two tests to receive the certification, which assesses basic computer repair skills. The International Society of Certified Electronics Technicians (ISCET) and the Electronics Technicians Association (ETA) also administer certification programs. Repairers may specialize in a variety of skills, including computer repair. To receive certification, repairers must pass qualifying exams corresponding to their level of training and experience. Both programs offer associate certifications to entry level repairers.

Newly hired computer repairers may work on personal computers or peripheral equipment. With experience, they can advance to

positions maintaining more sophisticated equipment, such as main-frame computers. Field repairers of automated teller machines may advance to bench technician positions responsible for more complex repairs. Experienced workers may become specialists who help other repairers diagnose difficult problems or work with engineers in designing equipment and developing maintenance procedures. Experienced workers may also move into management positions responsible for supervising other repairers.

Because of their familiarity with equipment, experienced repairers may also move into customer service or sales positions. Some experienced workers open their own repair shops or become wholesalers or retailers of electronic equipment.

### Job Outlook

Employment of computer, automated teller, and office machine repairers is expected to grow faster than the average for all occupations through 2008. Growth will be driven by the increasing dependence of business and residential customers on computers and other sophisticated office machines. The need to maintain this equipment in working order will create many new jobs for repairers. In addition, openings will result from the need to replace repairers who retire or move into new occupations.

Employment growth will vary by occupation. Employment of computer and automated teller machine repairers is expected to grow much faster than the average, as reliance on computers and ATMs continues to increase. Although computer equipment continues to become less expensive and more reliable, malfunctions still occur and can cause severe problems for users, most of whom lack the knowledge to make repairs. Computers are critical to most businesses today and will become even more so to companies that do business on the Internet and households that make purchases on-line. In addition, people are becoming increasingly reliant on ATMs. Besides bank and retail transactions, ATMs provide an increasing number of other services, such as employee information processing and the distribution of government payments.

Conventional office machines, such as calculators, are inexpensive and often replaced instead of repaired. However, digital copiers and other newer office machines are more costly and complex. This equipment is often computerized, designed to work on a network, and can perform multiple functions. The growing need for repairers to service such sophisticated equipment should result in average employment growth among office machine repairers.

### Earnings

Median hourly earnings of data processing equipment repairers, which includes repairers of computers and automated teller equipment, were \$14.11 in 1998. The middle 50 percent earned between \$10.72 and \$18.55. The lowest 10 percent earned less than \$8.09 and the highest 10 percent earned more than \$23.27. Median hourly earnings in the industries employing the largest number of data processing equipment repairers in 1997 are shown below:

Computer and data processing services .....	\$14.50
Professional and commercial equipment .....	13.40
Radio, television, and computer stores .....	10.90

Median hourly earnings of office machine and cash register servicers were \$13.38 in 1998. The middle 50 percent earned between \$10.68 and \$17.48. The lowest 10 percent earned less than \$8.46 and the highest 10 percent earned more than \$21.92. Median hourly earnings of office machine and cash register servicers working for wholesalers of professional and commercial equipment were \$12.80 in 1997.

### Related Occupations

Workers in other occupations who repair and maintain electronic equipment include broadcast and sound technicians; electronic home entertainment equipment repairers; electronics repairers, commercial and industrial equipment; and telecommunications equipment mechanics, installers, and repairers.

### Sources of Additional Information

For information on certification programs, contact:

☛ Computing Technology Industry Association, 450 East 22nd St., Suite 230, Lombard, IL 60148-6158.

Internet: <http://www.comptia.org>

☛ The International Society of Certified Electronics Technicians, 2708 West Berry St., Fort Worth, TX 76109. Internet: <http://www.iscet.org>

☛ Electronics Technicians Association, 602 North Jackson, Greencastle, IN 46135. Internet: <http://www.eta-sda.com>

## Electronic Home Entertainment Equipment Repairers

(O\*NET 85708)

### Significant Points

- Job opportunities will be best for applicants with a basic knowledge of electronics, as well as repair experience.
- Employment of repairers is expected to decline because it is often cheaper to replace equipment rather than pay for repairs.

### Nature of the Work

Electronic home entertainment equipment repairers, also called *service technicians*, repair a variety of equipment, including televisions and radios; stereo components; video and audio disc players; video cameras; and videocassette recorders. They also repair home security systems, intercom equipment, and home theater equipment, consisting of large-screen televisions and sophisticated, surround-sound systems.

Customers usually bring small, portable equipment to repair shops for servicing. Repairers at these locations, known as *bench technicians*, are equipped with a full array of electronic tools and parts. When larger, less mobile equipment breaks down, customers may pay repairers to come to their homes. These repairers, known as *field technicians*, travel with a limited set of tools and parts, and attempt to complete the repair at the customer's location. If the repair is complex, technicians may bring defective components back to the repair shop for a thorough diagnosis and repair.

When equipment breaks down, repairers check for common causes of trouble, such as dirty or defective components. Many repairs consist of simply cleaning and lubricating equipment. For example, cleaning the tape heads on a videocassette recorder will prevent tapes from sticking to the equipment. If routine checks do not locate the

trouble, repairers may refer to schematics and manufacturers' specifications that provide instruction on how to locate problems. Repairers use a variety of test equipment to diagnose and identify malfunctions. Multimeters measure the voltage and resistance of the power supply; color bar and dot generators provide on-screen test patterns; signal generators provide test signals; and oscilloscopes measure complex waveforms produced by electronic equipment. Repairers use handtools such as pliers, screwdrivers, soldering irons, and wrenches to replace faulty parts. They also make adjustments to equipment, such as focusing and converging the picture of a television set or balancing the audio on a surround-sound system.

Improved technologies have decreased the price of electronic home entertainment equipment. As a result, customers often replace broken equipment instead of repairing it.

### Working Conditions

Most repairers work in well-lighted electrical repair shops. Field technicians, however, spend much time traveling in service vehicles and working in customers' residences.

Repairers may have to work in a variety of positions and carry heavy equipment. Although the work of repairers is comparatively safe, they must take precautions against minor burns and electric shock. As television monitors carry high voltage even when turned off, repairers need to discharge the voltage, before servicing such equipment.

### Employment

Electronic home entertainment equipment repairers held about 36,000 jobs in 1998. Most repairers work in stores that sell and service electronic home entertainment products, or in electrical repair shops and service centers. About 1 in 5 electronic home entertainment equipment repairers was self-employed.

### Training, Other Qualifications, and Advancement

Employers prefer applicants who have basic knowledge and skill in electronics. Applicants should be familiar with schematics and have some hands-on experience repairing electronic equipment. Many applicants gain these skills at vocational training programs and community colleges. Some learn from working with electronic equipment as a hobby. Entry level repairers may work closely with more experienced technicians who provide technical guidance.

Field technicians work closely with customers and must have good communications skills and a neat appearance. Employers may also require that field technicians have a driver's license.

The International Society of Certified Electronics Technicians (ISCET) and the Electronics Technicians Association (ETA) administer certification programs for electronics technicians. Repairers may specialize in a variety of skill areas, including consumer electronics. To receive certification, repairers must pass qualifying exams corresponding to their level of training and experience. Both programs offer associate certifications to entry level repairers.

Experienced repairers with advanced training may become specialists or troubleshooters, who help other repairers diagnose difficult problems. Workers with leadership ability may become supervisors of other repairers. Some experienced workers open their own repair shops.

### Job Outlook

Employment of electronic home entertainment equipment repairers is expected to decline through 2008, due to decreased demand for repair work. Some job openings will occur, however, as repairers retire or gain higher paying jobs in other occupations requiring electronics experience. Opportunities will be best for applicants with hands-on experience and knowledge of electronics.

The need for repairers is declining because home entertainment equipment is less expensive than in the past. As technological developments have lowered equipment prices, the demand for repair services has decreased. When malfunctions do occur, it is often cheaper for consumers to replace equipment, rather than to pay for repairs.



Most electronic home entertainment equipment repairers work in retail stores or repair shops.